

METHODS AND APPARATUS FOR EFFECTUATING A LASTING CHANGE IN A
NEURAL-FUNCTION OF A PATIENT

ABSTRACT

The following disclosure describes several methods and apparatus for intracranial electrical stimulation to treat or otherwise effectuate a change in neural-functions of a patient. Several embodiments of methods in accordance with the invention are directed toward enhancing or otherwise inducing a lasting change in neural activity to effectuate a particular neural-function. Such lasting change in neural activity is defined as "neuroplasticity." The methods in accordance with the invention can be used to treat brain damage (*e.g.*, stroke, trauma, etc.), brain disease (*e.g.*, Alzheimer's, Pick's, Parkinson's, etc.), and/or brain disorders (*e.g.*, epilepsy, depression, etc.). The methods in accordance with the invention can also be used to enhance neural-function of normal, healthy brains (*e.g.*, learning, memory, etc.), or to control sensory functions (*e.g.*, pain). Certain embodiments of methods in accordance with the invention electrically stimulate the brain at a stimulation site where neuroplasticity is occurring. The stimulation site may be different than the region in the brain where neural activity is typically present to perform the particular neural function according to the functional organization of the brain. In one embodiment in which neuroplasticity related to the neural-function occurs in the brain, the method can include identifying the location where such neuroplasticity is present. In an alternative embodiment in which neuroplasticity is not occurring in the brain, an alternative aspect is to induce neuroplasticity at a stimulation site where it is expected to occur. Several embodiments of these methods that are expected to produce a lasting effect on the intended neural activity at the stimulation site use electrical pulses that increase the resting membrane potential of neurons at the stimulation site to a subthreshold level.